Division 2

SECTION 02072

MINOR DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of designated construction.

B. Disposal of materials.

C. Identification of utilities.

1.02 RELATED SECTIONS

A. Section 01011 - Summary of Work: Phasing; Owner's occupancy.

B. Section 01200 – Project Meetings: Re-installation of removed and stored products.

C. Section 01300 – Submittals

D. Section 01500 - Construction Facilities and Temporary Protection: Temporary enclosures, dust control barricades, security at Owner-occupied areas, and cleanup during construction.

E. Section 01700 - Contract Closeout: Project record documents.

1.03 SUBMITTALS FOR REVIEW

A. Section 01300 - Submittals: Procedures for submittals.

1.04 SUBMITTALS FOR CLOSEOUT

A. Section 01700 - Contract Closeout: Procedures for submittals .

B. Project Record Documents: Accurately record actual locations of capped utilities, subsurface obstructions, and changes to original design.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.

C. Obtain required permits from authorities.

D. Conform to procedures applicable when hazardous or contaminated materials are discovered.

1.06 PROJECT CONDITIONS

A. Conduct demolition to minimize interference with adjacent buildings and properties.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PREPARATION

A. Provide, erect, and maintain temporary barriers as needed.

B. Erect and maintain secure measures to prevent spread of dust, odors, and noise.

C. Protect existing materials that are not to be demolished.

D. Notify affected utility companies before starting work and comply with their requirements.

E. Mark location and termination of utilities.

3.02 DEMOLITION

A. Disconnect, remove, cap, and identify designated utilities within demolition areas.

B Demolish in an orderly and careful manner.

C. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.

D. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.

E. Remove temporary Work.

END OF SECTION

SECTION 02110

SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removing landscaping.

B. Removing existing concrete slabs.

C. Protecting existing utilities.

D. Excavating topsoil.

1.2 RELATED SECTIONS

A. Section 02200 - Earthwork

B. Section 02270 – Erosion Control.

1.3 SUBMITTALS

A. Section 01300 - Submittals: Requirements for submittals.

B. Product Data: Submit data for herbicide. Indicated compliance with applicable codes for environmental protection.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with City of Bozeman, MT and any applicable Montana Public Works Standard Specifications, Fifth Edition, March 2003.

B. Conform to applicable code for environmental requirements, disposal of debris, burning debris on site and use of herbicides.

PART 2 PRODUCTS

2.1 MATERIALS

A. Herbicide: As approved by local and state regulations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of existing conditions before starting work.

B. Verify existing plant life designated to remain is tagged or identified. Minimize clearing to grading limits and any Owner’s restrictions.

C. Identify salvage area for placing any removed materials.

3.2 PROTECTION

A. Locate, identify, and protect utilities indicated to remain from damage.

B. Protect trees, plant growth, and features designated to remain.

C. Protect benchmarks, survey control points, and existing structures from damage or displacement. Design-Builder shall replace damaged/displaced items at no cost to Owner.

3.3 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs in the construction zone. Remove stumps, main root ball, and surface rock. Roots may extend to five (5) feet deep. Fill in and compact after excavation. Construction Zone is identified as area inside silt fence.

C. Clear undergrowth and deadwood, without disturbing subsoil.

D. Remove all stumps.

3.4 WETLANDS

A. Identify any wetlands that occur on the site. Comply with all application regulations concerning development/construction of the site.

3.5 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. Remove any existing concrete slabs.

C. Continuously clean up and remove waste materials from site. Do not allow materials to accumulate on site.

D. Do not burn or bury materials on site. Leave site in clean condition.

3.6 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials for use in finish grading.

B. Do not excavate wet topsoil.

C. Stockpile on site to depth not exceeding and protect from erosion. Stockpile material on impervious material and cover over with same material, until disposal. Install silt fence around perimeter.

D. Remove excess topsoil not intended for reuse from site.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grading and earthwork for buildings, parking lots, and drives.

B. Grading and excavation for channels and ditches finishing and dressing of graded earth areas.

1.2 REFERENCES

A. ASTM D698 - Test Methods for Moisture-density Relations of Soils and Soil-aggregate Mixtures, Using 5.5 lb. (2.49 Kg) Rammer and 12-inch (304.8 mm) Drop.

B. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-cone Method.

C. ASTM D1557 - Test Methods for Moisture-density Relations of Soils and Soil-aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18-inch (457 mm) Drop.

D. Standard Test Method for Classification of Soils for Engineering Purposes.

E. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Method).

F. Any applicable Montana Public Works Standard Specifications, Fifth Edition, March 2003

1.3 RELATED DOCUMENTS

A. Section 02072 – Minor Demolition.

B. Section 02270 - Erosion Control and Sedimentation Control.

1.4 DEFINITION

A. Excavations consist of removal of material encountered to subgrade elevations required and subsequent disposal or stockpiling of materials removed.

1.5 QUALITY ASSURANCE

A. Testing and Inspection Service: Design-Builder will provide soil testing and inspection service for quality control testing during earthwork operations by hiring a qualified testing service.

1.6 JOB CONDITIONS

A. Site Information:
   1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Design-Builder.
      a. A geotechnical Investigation was performed by ???, which report is included as an appendix to these specifications. The report is dated ???.
   2. Additional test borings and other exploratory operations may be made by the Design-Builder at no cost to the Owner.

B. Existing Utilities: A limited general survey of the existing utilities is available; however, no guarantee is

made as to the existence of additional unmarked lines. The Design-Builder is responsible for determining the presence and location(s) of any existing utilities.

C. Use of Explosives: The use of explosives shall not be permitted.

D. Protection of Persons and Property:
1. Barricade open excavations occurring as part of this work and post with warning lights.
2. Operate warning lights as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazardous conditions created by earthwork operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS:

A. General: Where the terms "approved", "suitable", "unsuitable" and similar designations are used, it means earth or material designated as being approved, suitable or unsuitable for their intended use as defined by the standards indicated below or by the Owner's Project Manager.

B. Suitable Soil Materials are defined as those complying with ASTM D-2487 soil classification groups: GW, GP, GM, SM, SW, and SP. SC materials should be considered as suitable for pond embankment construction.

C. Unsuitable Soil Materials are defined as those only complying with ASTM D-2487 soil classification groups GC, SC, MH, ML, CL, CH, OL, OH, PT. Clays, silts, and organic soils will be considered as unsuitable materials. Excess water in materials will be a basis for establishing unsuitable material regardless of gradation.

D. Backfill and Fill Materials shall be suitable soil materials, free of clay, rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. Suitable materials for earth fill shall generally be composed of sands, clay-sand and silt-sand mixtures and shall be approved by the Owner's Project Manager prior to being incorporated in fills.

E. Borrow shall consists of sand or sand clay soils capable of being readily shaped and compacted to the required densities, and shall be free of roots, trash and other deleterious material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Temporary and permanent site drainage shall be established to promote drainage away from proposed building and pavements before earthwork begins.

3.2 EXCAVATION

A. Excavation is unclassified and includes excavation to subgrade elevations required, regardless of character of materials and obstructions encountered.

B. All suitable material removed in the excavation shall be used as far as practicable in formation of embankment, subgrades and shoulders.

C. Unauthorized Excavation consists of removal or loosening of materials beyond required subgrade elevations or dimensions without specific directions of the Owner's Project Manager. Unauthorized excavation, as well as remedial work directed by Owner's Project Manager shall be at Design-Builder's expense.

D. Additional Excavation: When excavation has reached required subgrade elevations and unsuitable materials exist, carry excavations deeper and replace excavated materials.

E. The Design-Builder shall dispose of unsuitable and surplus materials.

F. Stability of Excavations:
1. Slope sides of excavations to comply with local codes and ordinances having jurisdiction.
2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
3. Comply with OSHA requirements at all times.

G. Dewatering: Prevent surface water and subsurface or ground water flowing into excavations and from flooding project site and surrounding area.
1. Provide dewatering system components necessary to convey water away from excavations.
2. The Design-Builder will be responsible for all damage incurred in handling water conditions.

H. Material Storage: Stockpile satisfactory excavated materials until required for backfill or fill. . Locate and retain soil materials for proper drainage, to minimize erosion, and away from edge of excavations. Do not store within drip-line of any trees indicated to remain.

I. Excavation for Structures: Conform to elevations and dimensions required within a tolerance of plus or minus 0.10'.

J. Excavation for pavements and cut surface under pavements to comply with required elevations and grades.

K. Maintain proper drainage at all times.

L. Perform excavation within drip-line of large trees to remain by means to prevent any damage to trees. Protect existing trees and shrubs at all times during earthwork operations. No trees shall be removed without prior approval of the Owner's Project Manager.

3.3 EXCAVATION OF DITCHES AND PONDS

A. Ditches and ponds shall be cut accurately. .

B. All roots, stumps and other foreign matter in the sides and bottom of excavations shall be cut 18 inches below required grades.

C. Any excessive excavation shall be backfilled to grade with satisfactory soils thoroughly compacted, suitable stone or cobble to form an adequate ditch paving, at no additional cost to the Owner.

3.4 BORROW

A. Borrow material hall be procured, excavated and hauled by the Design-Builder from his own sources at his own expense and shall meet the specified requirements as specified.

3.5 GROUND SURFACE PREPARATION FOR FILL

A. All vegetation such as roots, brush, heavy sods, heavy growth of grass, decayed vegetation matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.

3.6 BUILDING PAD

A. Perform all operations necessary for proper placement of the building pad and to insure that the pad will not settle.

3.7 FILL

A. Shall be free from roots, organic material, trash and stones having maximum dimensions of 6 inches.

B. Shall be placed in successive horizontal layers in accordance with applicable requirements and compact as required with appropriate equipment

3.8 FINISH GRADING

A. All areas covered by the project including excavated and filled sections and adjacent transition areas shall be smooth graded and free from irregular surface changes.

B. The finished surface of unpaved areas shall be not more than 0.05' feet above or below the established grade or designed cross-section. Grading shall be done in order that no ponding will occur.

3.9 BUILDING SLAB DRAINAGE COURSE

A. General: Drainage course consists of placement of drainage fill material over subgrade surface to support concrete building slabs.

3.10 BUILDING FOUNDATION

A. Each footing excavation shall be cleaned and compacted prior to placing any reinforcing steel or concrete. Soft, loose or otherwise questionable soils should be stabilized. The footing bottom should be free of all fall-in prior to placing concrete.

B. Design-Builder shall provide, at his cost, evaluation of excavations prior to completing footing construction.

3.11 DISPOSAL OF WASTE MATERIAL

A. All vegetation, roots, brush, sod, broken pavements, curb and gutter, rubbish, and other unsuitable or surplus material stripped or removed from the limits of construction shall be disposed of by the Design-Builder.

3.12 PROTECTION

A. Protect existing trees and shrubs at all times during earthwork operations. No trees shall be removed without prior approval by the Owner’s Project Manager.

B. The Design-Builder shall be responsible for protection of below grade utilities at all times during earthwork operations.

C. Graded areas shall be protected from traffic, erosion, settlement, or any washing away that may occur from any cause prior to acceptance.

D. Any repair or reestablishment of grades prior to final acceptance shall be at the Design-Builder’s expense.

3.13 FIELD QUALITY CONTROL

A. General: Design-Builder shall perform compaction of earth fill, foundation, and all pavement subgrades to the percentage of maximum standard of modified dry densities as required:
   1. Roadway and driveway Subgrades: 98% Standard (ASTM Test D-698). Compact top 12" in parking areas and top 15" in Driveways and each layer of fill.
   2. Subgrades under pavement removed and replaced for utility installations: 98% Standard

(ASTM Test D-1557) to 12 inch depth and each layer of fill.

3. Structural Fill under all structures, slabs and steps: 98% of ASTM D-698. Compact top 12 inches of subgrade and each layer of fill.
4. Subgrade below Sidewalks and Curb and Gutters: 95% Standard (ASTM Test D-698). Compact top 6 inches.
5. Unpaved Areas to be grassed, sodded or landscaped: 95% Standard (ASTM Test D-698) full depth. Compact top 6 inches of subgrade and each layer of backfill.
6. All other areas not described above: As directed by the Owner's Project Manager.

B. Moisture Control: All compaction shall be performed at material moisture contents within 3 percentage points, plus or minus, of optimum.

1. Field Density Tests: Tests shall be made in accordance with ASTM Method D-1556 and/or ASTM 2922.
2. Maintain +/- 2% optimum moisture content for subgrade of pavements and building slabs.
3. If, in opinion of Owner's Project Manager, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density, additional compaction and testing will be required at the Design-Builder's expense.

D. Proof Rolling: Proof rolling of the subbase or subgrade of all areas of new paving will be required. Equipment shall have minimum and maximum axle loads as required by applicable state standards.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING AND COMPACTING FOR UTILITY SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Material Classification

B. Excavation

C. Dewatering

D. Backfilling and Compaction

E. Testing

1.2 RELATED SECTIONS

A. Section 02270 - Erosion Control

B. Section 02500 – Storm Drainage System

C. Section 02550 – Water Distribution System

D. Section 02554 – Wastewater Collection System

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM C136 Sieve Analysis of Fine and Course Aggregates
2. ASTM D698 Moisture - Density Relations of Soils and Soil - Aggregate Mixtures Using 5.5 lb. Rammer and 12 inch Drop.
3. ASTM D1556 Density of Soil In-Place by the Sand-Cone Method
4. ASTM D2487 Classification of soils for engineering purposes.
5. ASTM D2488 Description of soils (visual - manual Procedure).
6. ASTM D2922 Density of Soil and Soil-Aggregate In-Place by Nuclear Methods.
7. ASTM D3017 Moisture Content of Soil and Soil-Aggregate In-Place by Nuclear Methods.
8. ASTM D4318 Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils

B. AASHTO

1. AASHTO T11 Materials Finer Than 0.075mm (No. 200) Sieve in Mineral Aggregates by Washing
2. AASHTO T89 Determining the Liquid Limit of Soils
3. AASHTO T90 Determining the Plastic Limit and Plasticity Index of Soils

C. American Wood Preserver's Association (AWPA)

1. C2 Lumber Timbers, Bridge ties and Mine Ties - preservative treatment by pressure process.
2. P5 Water - Borne Preservatives

D. Any applicable provisions of the Montana Public Works Standard Specifications, Fifth Edition, March 2003.

1.4 JOB CONDITIONS

A. Existing Utilities:
1. Locate existing underground utilities in areas of work.
2. Provide adequate means of support and protection during earthwork operations.
3. Utilities encountered during excavation, uncharted or incorrectly charted shall be kept in operation. Consult Owner's records, City of Bozeman Engineer, and any other necessary sources about utility locations.
4. Repair damaged utilities to Owner's satisfaction at no cost to Owner.
5. Do not interrupt existing utilities serving facilities occupied and used, during occupied hours, unless acceptable temporary utility services have been provided.
6. Provide minimum of 48-hour notice to Owner and receive notice to proceed before interrupting any utility.

B. Protection of Persons and Property:
1. Provide adequate barricades, construction signs, torches, red lanterns and guards as required.
2. Protection shall be placed and maintained by the Design-Builder at his expense during the progress of the construction.
3. Obstructions to traffic, material piles, equipment and pipe, shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor.
4. The rules and regulations of O.S.H.A. and appropriate authorities safety provisions shall be observed.
5. Shoring and Sheeting shall be used if the soil conditions are not substantial to prevent undermining or movement of pavements, slabs, banks, or trenched.
6. Protect satisfactory material from becoming spoiled by water, debris, organic material.

1.5 SUBMITTALS

A. Copies of laboratory and field test reports

B. Dewatering Plan: Describe methods and equipment used for dewatering.

PART 2 - PRODUCTS

2.1 SATISFACTORY MATERIALS

A. Satisfactory materials are materials designated as being satisfactory for their intended use by soil technicians.

B. Satisfactory material shall consist of any material classified by Unified Soil Classification System (USCS) and ASTM D2487, Table 1 as GW, GP, GM, GC, SW, SP, SM, and SC.

2.2 UNSATISFACTORY MATERIALS

A. Unsatisfactory materials shall be materials that are unsatisfactory for their intended use and as designated by soil technicians.

B. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 3 inches and materials classified in USCS as PT, OH, OL, CH, MH, CL, and ML.

C. Unsatisfactory materials also include man-made fills, refuse, or backfill from previous construction.

D. Satisfactory materials, which are classified as wet or saturated by ASTM D2488, shall be considered unsatisfactory material unless dried to optimum moisture content.

2.3 COHESIONLESS AND COHESIVE MATERIALS

A. Cohesionless materials shall include materials classified in USCS as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, GL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic.

2.4 UNYIELDING MATERIAL

A. Unyielding material shall consist of rock and gravelly soils with stones greater than 3 inches in any dimension or as defined by the pipe manufacturer, whichever is smaller.

2.5 UNSTABLE MATERIAL

A. Unstable material shall consist of materials unable to properly support the utility pipe, conduit, or appurtenance structure.

2.6 DEGREE OF COMPACTION

A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D-698.

2.7 EMBEDMENT MATERIALS

A. Embedment materials listed herein include a number of processed materials plus the soil classifications listed under the Unified Soil Classification System (USCS) (Method D 2487 and Practice D 2488). These materials are grouped into four broad categories according to their suitability for this application.
   1. Class I - Angular, 6 to 40 mm (1/4 to 1-1/2 inch), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
   2. Class II - Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 inch), including variously graded sands and gravels containing small percentage of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
   3. Class III - Fine sand and clay gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM and SC are included in this class.
   4. Class IV - Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class.

PART 3 - EXECUTION

3.1 CONSTRUCTION METHODS

A. Construction on site:
   1. Confine all operations to the limits of construction.
   2. Take precautions to prevent any cave-in of disturbance beyond the construction limits or damage to improvements within the site.
   3. Restore damage areas outside of the construction limits to original condition.
   4. Fences, shrubbery or other type of surface improvements located in the construction area will require protection during construction.
   5. Organize operations to perform within the construction limits.

B. Protection of Property and Surface Structures:
   1. Protect property and surface structures during construction operations.
   2. Restore to the original conditions fences, poles or other man-made surface improvements that are disturbed. Expense for restoration shall be borne by the Design-Builder.
   3. At no cost to Owner, the Design-Builder shall restore damage caused by construction operations to landscape improvements that were not authorized for removal.

3.2 EXCAVATION

A. Excavation shall be performed to the lines and grades indicated. No classification of excavation will be made.

B. Stockpile:
   1. Stockpile material satisfactory for backfilling at a sufficient distance from the trench to avoid overloading and to prevent slides or cave-ins.
   2. Provide adequate drainage for the stockpiles and surrounding areas.
   3. Grade to prevent surface water from flowing into the excavation.
   4. Protect stockpiles from contamination.
   5. Satisfactory material that becomes contaminated shall be removed and replaced with satisfactory material at no additional cost to the Owner.
   6. Excavated material not required or unsatisfactory for backfill shall be completely removed from the site.
   7. Avoid obstructing sidewalks and driveways.
   8. Leave fire hydrants, valve pit covers, valve boxes, curb stop boxes, or other utility controls unobstructed and accessible.
   9. Provide adequate erosion control devices to prevent damage to surrounding construction areas.

C. Trench Excavation:
   1. Excavate to the dimension and depth required.
   2. Slope or brace trench walls above the initial backfill area to meet OSHA requirements. Vertical side wall shall be maintained below the initial backfill area.

D. Sheeting, Shoring and Bracing:
   1. Open-cut trenches shall be sheeted and braced or otherwise protected as required to protect life, property, or the work and as required by Federal, State, municipal ordinances and O.S.H.A. Safety and Health Standards for Construction.

E. Trenches With Sloping Sides:
   1. When working conditions and right-of-way permit allow, excavate pipe line trenches with sloping sides.

3.3 DEWATERING

A. Trenches shall be kept dewatered at all times by approved means.

B. Surface water shall be prevented from flowing into trenches.

C. Disposal of water shall be in accordance with local erosion and sediment control regulations.

D. Running Water: Remove running water from trench before laying pipe.

3.4 BACKFILL AND COMPACTION

A. Backfill shall be placed in layers not exceeding 6 inches loose thickness for hand operated machine compaction, and 8" loose thickness for other than hand operated machines.
   1. Each layer shall be compacted to at least 95% maximum density for cohensionless soils and 90 % maximum density for cohesion soils, unless otherwise specified.
   2. Compaction shall be tested by ASTM D698.

B. Replacement of Unyielding or Unstable Material: Unyielding or unstable material removed from the bottom of the trench shall be replaced with satisfactory material of class specified for that trench section.

C. Foundation: Take care to undercut only what is required for bedding and leave foundation undisturbed. In situations where unstable material is encountered below the bedding, it shall be removed to the depth required, replaced with appropriate material in 6" layers and compacted to 95% of maximum density.

D. Bedding: shall consist of Class I materials.

3.5 TESTING

A. Testing and inspection services: Design-Builder shall engage soil testing and inspection service for quality control testing during trenching and backfilling operation. Refer to Section 01400.

B. Determination of Density:
   1. Testing facility: An approved commercial testing laboratory shall perform density tests. Approval of testing facilities shall be based on compliance with ASTM E 548.
   2. Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained.
   3. Laboratory tests for moisture-density relations shall be determined in accordance with ASTM D 698 or ASTM D 1557, as specified in these specifications.
   4. Field in-place density shall be determined in accordance with ASTM D 2167.
   5. Copies of test results shall be furnished to the Owner's Project Manager within 24 hours of conclusion of the tests.
   6. Trenches improperly compacted shall be reopened to the necessary depth, then refilled and compacted to the density specified at no additional cost to the Owner.

3.6 RESTORATION OF PRE-EXISTING CONDITIONS

A. Areas disturbed by operations required under this Section shall be restored at no cost to Owner.

B. Any disturbance outside the construction area shall be restored to the original condition or satisfaction of the Owner's Project manager at no cost to the Owner.

C. Paved Areas: Restore to the original conditions conforming to these specifications.

D. Lawns and Yards: Established greenways on site; sod lawn and replant scrubs.

E. Surfaces Structures:
   1. Trees, shrubbery, fences, poles and all other surface structures shall be protected during construction operations.
   2. Any fences, poles or other manmade surface improvements which are moved or disturbed by the Design-Builder shall be restored, at his expense, to their original condition.
   3. The Design-Builder shall be responsible for damage or claims of damage caused by construction operations to shrubbery or other landscape improvements.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Dust control

B. Silt Fence

C. Hay Bales

D. Filter Fabric

E. Stone

F. Grassing

1.2 RELATED SECTIONS

A. Section 02072 – Minor Demolition

B. Section 02200 - Earthwork.

C. Section 02221 – Trenching, Backfilling and Compaction for Utility System

1.3 SUBMITTALS

A. Submit in accordance with section 01300.

B. Schedule of Operations: Submit schedule of starting and completion dates for land distributing activities, including demolition, excavation, filling, rough grading, finish grading, and construction of temporary and permanent control measures, and disposition of temporary control measures.

1.4 JOB CONDITIONS

A. Work described in this section includes temporary erosion control during construction.

B. Schedule installation of sediment control basin, temporary gravel construction access road and stone check dams prior to clearing and grubbing. The remaining erosion control devices to be installed before grading.

C. Schedule grading operations to allow paving and permanent erosion control to take place in the same construction season, if possible. Avoid or minimize exposure of soils to winter weather.

D. Construct and maintain temporary erosion control structures until such time as permanent paving, planting and restoration of natural areas is effective in control of erosion from the site.

PART 2 - PRODUCTS

2.1 CHEMICALS FOR DUST CONTROL:

A. Calcium Chloride, Anionic Asphalt Emulsion, Latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.2 SILT FENCE FABRIC:

A. Silt fence fabric shall be a woven fabric certified to meet FHWA's Task Force 25 minimum roll average per ASTM-D-4354. The fabric should be finished so that the filaments will retain their relative position with respect to each other. The fabric shall be free of defects, rips, holes, or flaw; equivalent to EXXON GTF-180 Fabric or AMOCO Woven Construction Fabric No. 1380, or approved equal.

2.3 HAY BALES:

A. Hay bales rectangular in shape shall be bound with wire or nylon to securely contain the material. Pine straw bales may be used in lieu of hay bales.

2.4 PLASTIC FILTER FABRIC:

A. Plastic filter fabric shall be a pervious sheet of plastic yarn, of a long chain synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and/or heat exposure. The cloth shall be free of defects, rips, holes, or flaws. The fabric shall be equivalent to EXXON GTF-400E or AMOCO Woven Construction Fabric No. 2002, or approved equal.

2.5 STONE:

A. Stone shall be hard quarry, granite or field stone and shall be of such quality that the stone will not disintegrate on exposure to water or weather. The stone size, type and weight shall be appropriate for the structure with which it is associated. The stone shall be accepted by the Owner’s Project Manager prior to delivery.

PART 3 - EXECUTION

3.1 GENERAL:

A. The Design-Builder shall employ all reasonable means to control erosion during the project. All erosion and sedimentation control measures or facilities, whether temporary or permanent, shall be continuously maintained by the Design-Builder.

3.2 BUFFER ZONE:

A. Buffer zone is an undisturbed zone or "green belt" surrounding the site, bordering streams or environmentally sensitive areas. Design-Builder, including sub-contractors, shall not trespass on or in these areas without prior approval by the Owner. Trespass in these areas will not be permitted unless there is no alternative method to accomplish the task. Cost shall not come into consideration in the evaluation of this type of request.

3.3 DISTURBED AREA STABILIZATION:

A. Vegetative cover will be placed on completed areas. This vegetative plan will be carried out on road cut and fill slopes, shoulders, and other critical areas created by construction.

3.4 DUST CONTROL ON DISTURBED AREAS:

A. Control dust raised from vehicular traffic by wetting down the access road with water or by the use of a deliquescent chemical, such as calcium chloride, if the relative humidity is over 30%. Chemicals shall be applied in accordance with the manufacturer's recommendations.

3.4 SILT FENCE:

A. Silt fence shall be placed and installed at location(s) necessary for erosion control in accordance with the manufacturer's recommendations.

3.5 STORM DRAIN OUTLET PROTECTION:

A. Storm drain outlets shall be paved or have a rock or other energy dispersion device associated with it as necessary to protect the outlet.

3.8 SITE RESTORATION:

A. The site shall be restored in a manner suitable to accommodate the erosion control device or system of devices for the use which they are intended.

3.9 TOPSOIL:

A. If topsoil is stripped and stored on site to be used after construction, the stockpile side slopes shall be 2:1 or flatter. Stockpiled of topsoil shall not obstruct natural drainage. Topsoil replacement shall be spread at minimum of 4" thickness.

3.10 SITE SAFETY:

A. The Contractor shall incorporate and utilize all necessary fencing and other safety barriers as necessary, or directed by the Owner to prevent trespassing into potentially dangerous erosion control areas.

END OF SECTION

SECTION 02281

TERMITE CONTROL

PART 1 GENERAL

1.01 SUBMITTALS

A. Product: Submit toxicant manufacturer's data indicating chemical to be used and installation instructions.

1.02 JOB CONDITIONS

A. Scheduling:
   1. Give Owner's Project Manager 48 hours notice prior to time termite control material application is to commence.
   2. Make application during normal working hours.
   3. Allow not less than 12 hours for drying after application, before covering treated area.

B. Post signs in areas of application, warning that poison has been applied. Remove signs before treated areas are covered by other construction.

1.03 QUALITY CRITERIA

A. Applicator shall be a state licensed pest control operator.

B. Qualification of toxicant: Toxicant shall be acceptable to the State of Montana and the Forest Service of the U.S. Department of Agriculture, Division of Forest Research, for use in controlling termite infestation of buildings, without being injurious to plant life.

1.04 WARRANTY

A. Warrant effectiveness of treatment for period of five years, without additional cost to the owner during warranty period. Warranty shall be in the form of an insurance policy, written in the amount of Five Thousand Dollars ($5,000.00) for damages to building and contents. The warranty shall be submitted with Contract closeout documents.

B. Warranty shall state date of application and chemicals used, including quantities and concentrations.

C. Warranty shall state that the policy coverage may be renewable on a year-to-year basis at end of the five year period, at the Owner's option, for a fee to be agreed upon between the applicator and Owner at time of renewal.

D. Retreatment, upon evidence of subterranean termite activity during warranty period, shall be made at no charge to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Chemical shall be applied in a water solution.

B. Acceptable chemicals and their concentration:
   1. Permetrin – Dragnet FT Termiticide as manufactured by FMC (concentration as recommended by manufacturer for specific apllication.)

C. Toxicants shall be registered by the Environmental Protection Agency for their intended use and shall be accepted by the U.S. Department of Agriculture for use in controlling termite infestation of buildings, without being injurious to plant life.

D. Mixtures of the above chemicals are prohibited.

PART 3 EXECUTION

3.01 APPLICATION

A. Apply material at the rate recommended by manufacturer for intended use along both sides of foundation wall.

B. Apply at the rate recommended by manufacturer for intended use under concrete slabs on grade.

C. Perform no treatment when soil is wet or immediately after rains. Avoid flow of toxicant from treated surfaces.

END OF SECTION

SECTION 02485

GRASSING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fertilizer

B. Lime

C. Seed

D. Mulch

1.2 QUALITY ASSURANCE

A. Seed: Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging and locations of packaging.

1.3 REGULATORY REQUIREMENTS

A. Comply with regulatory agencies for fertilizer and herbicide composition. Comply with applicable portions of Montana Public Works Standard Specifications, Fifth Edition, March 2003.

1.4 DELIVERY, STORAGE, AND PROTECTION

A. Section 01600 - Material and Equipment: Transport, handle, store, and protect products.

1.5 MAINTENANCE SERVICE

A. Provide service and maintenance of seeded areas for three months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS GENERAL

A. The Design-Builder shall, at the time of delivery, furnish the Owner's Project Manager invoices of all materials, received in order that the application rate of materials may be determined.

2.2 FERTILIZER

A. 10-10-10, commercial fertilizer of accepted type and formula, conforming to state fertilizer laws.

2.3 LIME

A. Lime shall be agricultural grade, ground limestone and shall conform to the requirements of the Montana Department of Agriculture. Lime to be added based on soil test.

2.4 SEED

A. Seal and label all seed containers to comply with Montana Seed Law and Regulations or meeting U.S.D.A. and Regulations under the Federal Seed Act, if shipped in interstate commerce.

B. The several varieties of seed shall be individually packaged or bagged, and tagged to show seed name, lot number, net weight, percentages of purity, germination, hard seed, and percentage of maximum weed seed content for each seed species.

2.5 SEEDING SCHEDULE

A. Apply seed appropriate for the use and environment at a rate per acre and at the required depth to insure complete coverage. Pure line seed shall be 82% by weight, with a maximum weed seed of 0.50%.

B. In shaded areas, or other areas as directed by the Owner's Project Manager, the Design-Builder shall use a mixture of appropriate seeds applied at recommended rates to achieve coverage in such areas.

C. Temporary grassing shall consist of annual rye or other appropriate grass seed at a rate of 75 pounds per acre.

D. In areas where existing grasses are to be matched, the Design-Builder shall sow the seed at the rate recommended by the seed distributor.

2.6 MULCH

A. Acceptable mulch materials
   1. Straw or hay mulch
   2. Excelsior mulch
   3. Wood cellulose fiber mulch

B. Quality Standards
   1. Materials shall be reasonably dry and shall be reasonably free from contaminants. The Design-Builder shall also comply with all State of Montana and Federal domestic plant quarantine regulations.
   2. Materials shall be obtained from reliable, accepted sources.

C. Suppliers shall be prepared to certify that laboratory and field testing of their project has been accomplished, and that it meets all of the foregoing requirements based upon such testing.

D. Weight specifications for this material from suppliers and for all applications shall refer only to air-dry weight of fiber material. Each package of cellulose fiber shall be marked by the manufacturer to show the air-dry weight content.

PART 3 - EXECUTION

3.1 STAND OF GRASS

A. Before acceptance of the seeding performed for the establishment of permanent vegetation, the Design-Builder will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and the winter weather and be capable of re-establishment in the spring.

B. Before acceptance of the seeding performed for the establishment of temporary vegetation, the Design-Builder will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent vegetation is to commence.

3.2 SEEDING DATES AND RATES OF APPLICATION

A. Perform seeding when temperature and moisture are favorable for germination and growth. Seed preferably before June 1st and after October 1st of each year. Seeding work shall not be conducted when the ground is frozen or excessively wet. Seeding dates must be approved by the Owner.

3.3 PREPARATION

A. The areas to be seeded shall be made smooth and uniform and shall conform with the finished grade and cross section required.

B. The areas to be grassed, if not loose, shall be loosened to a minimum depth of 3 inches before agricultural lime, fertilizer, seed or sod is applied.

3.4 APPLYING LIME AND FERTILIZER

A. Following advance preparation and placing selected material for shoulders and slopes, lime (if called for based on soil tests) and fertilizer shall be spread uniformly over the designated areas and thoroughly mixed with the soil to a depth of approximately 2-inches.

B. Fertilizer shall be applied at the pounds-per-acre quantity recommended for the initial application.

3.5 SEEDING

A. Seed shall be sown within 24 hours following the application of fertilizer and lime and preparation of the seedbed as specified above. Seed shall be uniformly sown at the rate specified by appropriate means.

B. Apply water with fine spray immediately after each area has been sown.

C. All seeded areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations.

3.6 MAINTENANCE

A. Maintain seeded surfaces until final acceptance by providing protection against traffic, by watering, and by repairing any areas damaged as a result of construction operations or erosion.

3.7 ACCEPTANCE

A. Before release of the performance bond on the seeding and sod performed for the establishment of permanent vegetation, the Design-Builder will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and winter weather and be capable of reestablishment in the spring.

END OF SECTION

SECTION 02500

STORM DRAINAGE SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Storm drainage piping, fittings, and accessories.

B. Catch basins, junction boxes and drop inlets.

1.02 REFERENCES

A. ANSI/ASTM C76 - Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

B. American Association of State Highway and Transportation Officials Specification M-196.

C. American Association of State Highway and Transportation Officials Specification M-294.

D. State of Montana and City of Bozeman pecifications and details.

1.03 RELATED SECTIONS

A. Section 02221 – Trenching, Backfill, and Compaction for Utility Systems.

B. Section 03300 - Concrete.

1.04 CLOSE OUT DOCUMENTS

A. Design-Builder shall provide any close out documents required by the City of Bozeman.

B. Refer to Section 01700 – Project Closeout.
   1. Elevations shown shall be based on the North American Vertical Datum of 1988 (NAVD 88).
   2. All measurements and coordinates shown shall use the U.S. Survey Foot definition.

C. Coordinates shall be shown on all drainage structures, retention facilities, manholes, valves, fire hydrants, tees and bends.

1.05 QUALITY CONTROL

A. Provide video taping of storm drainage piping after trenching, hunching, and backfilling is complete.

PART 2 - PRODUCTS

2.01 DRAINAGE PIPE MATERIALS

A. Reinforced Concrete Pipe:
   1. ANSI/ASTM C76, Class III, IV, or V concrete pipe with wire mesh reinforcement and inside nominal diameter as shown on plans.
   2. Lifting Holes: Lifting holes will be allowed and will be grouted closed.
   3. Joints: Unless otherwise specified, joints shall be in accordance with ASTM C-76. Joint sealer shall be required. When watertight joints are specified, joints and gasket

material shall be R-4 in accordance with ASTM C443. All other joints shall be sealed with RAM-NEK, or approved equal.

B. Construction Fabric Pipe Wrap: Highly water permeable, needle punched, nonwoven fabrics with random, three-dimensional pore structure.

2.02 CATCH BASINS, DROP INLETS, JUNCTION BOX FRAMES AND GRATES

A. Provide per Montana DOT Standards. All structures shall be precast unless otherwise noted.

B. Basin Lid and Frame: Cast iron construction, checker board design, sized to match the full inside dimensions of the inlet. Grates shall be “bike friendly”.

C. Manhole castings shall be cast iron meeting ASTM Serial Designation A48-62, Class 30B, "Anti-Rattle" type.

D. Shaft construction to be reinforced precast concrete basin sections, lipped male/female dry joints, size and thickness(es) as required.

E. Base Pad: Cast-in-place 3000 psi concrete. Level top surface to receive concrete brick or pre-cast concrete section.

2.03 JUNCTION BOXES

A. Lid and Frame: Cast iron construction, removable lid, nominal lid and frame diameter of 24 inches.

B. Shaft construction to be reinforced precast concrete basin sections, lipped male/female dry joints, size and thickness(es) as required.

C. Base Pad: Cast-in-place 3000 psi concrete. Level top surface to receive concrete brick or pre-cast concrete section.

D. Pre-cast concrete manholes shall meet ASTM Specifications, Serial Designation C478 latest revision and have "O" ring gasket joints meeting ASTM Specifications, Serial Designation D443 latest revision.

2.04 BRICK

A. Brick shall meet ASTM Serial Designation C26 for common brick, Grade C.

2.05 CEMENT MORTAR JOINTS

A. All concrete pipe shall be laid with cement mortar joints. The mortar mixture shall be one part Portland Cement and two parts clean sand by volume.

B. Only enough water shall be used to make a stiff, workable mortar and no more than 5.5 gallons of water per sack of cement shall be used.

2.06 CONCRETE MATERIALS

A. Portland Cement shall conform to Section 03300 and the specifications of ASTM, Serial Designation C-150 latest revision.

B. Cement shall be stored in a weather-tight enclosure.

C. Hydrated lime shall meet the specifications of ASTM, Serial Designation C207 latest revision.

D. Fine aggregate shall conform to the following ASTM Specifications, latest revisions:
   1. For concrete: Serial Designation C33
   2. For masonry mortar: Serial Designation C144

E. Coarse aggregate for concrete shall consist of crushed granite conforming to the current ASTM Specifications C33. Aggregate shall be cleaned, hard and uncoated.

F. Water for mortar and concrete must not be contaminated by salt, oil, acid or other material which may be harmful.

2.07 REINFORCING STEEL

A. Reinforcing steel shall be of approved deformed typed and meet all requirements of ASTM Standard Specifications for new Billet Steel Reinforcement Bars, Serial Designation A150. Bars will be structural or intermediate grade open-hearth steel.

2.08 BACKFILL MATERIALS

A. Reused or import subsoil as specified in Section 02221.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Design-Builder shall notify Owner's Project Manager so the trench cut or excavation base can be verified if it is ready to receive work and excavations.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Ttrim excavations to required elevations. Correct over excavation with fill material of fine aggregate. Remove large stones or other hard matter which could damage drainage tile or impede consistent backfilling or compaction.

3.03 HIGHWAYS, STREETS, AND PUBLIC PROPERTY

A. The Design-Builder's operations in highways or public streets shall be confined to as small a space as is practicable.

B. The Contractor shall fully adhere to the State Highway Department Encroachment Permit while operating in any State Right-of-Way.

C. Pavement, base, and subgrade courses which must be removed for constructing sewers and appurtenances in or across highways, roadways, and streets shall be replaced with the same general class and type of material used in the initial construction unless approved by the City of Bozeman.

D. Through traffic shall be maintained at all times during construction of sewer across all streets and highways.

E. All construction techniques shall comply with current editions of the State Highway Department Standard Specifications and Traffic Control Manual.

F. The Design-Builder shall provide suitable bridgesfor any area where traffic will cross a trench.

3.04 EXISTING UTILITIES AND STRUCTURES

A. The Design-Builder shall give written notice to all highway departments, municipalities, and utility companies whose poles, wires, pipes, conduits, survey monuments, bench marks, or structures/utilities may be affected by his operations. The coordination and the removal and placement of the utilities shall be the Design-Builder's responsibility.

B. Any existing utilities, structures, monument, damaged by the Design-Builder shall be repaired or replaced by him at his own expense.

C. The approximate position of certain known underground lines shown on any available drawings is for information only.

D. The Design-Builder shall locate all utilities.

E. Design-Builder shall excavate and expose all existing underground lines in advance of trenching operations.

F. Removing and relaying of existing utility lines and appurtenances due to interference with the proposed line and grade will be completed at the Design-Builder's expense. The re-laying of existing utility lines (water and sanitary sewer) shall conform to City of Bozeman Standard Specifications. Gas, telephone, and Cable TV shall conform to the utility owners' standards for material and installation.

G. Water and sewer house service lines shall be protected and remain. If these lines are broken or displaced the Design-Builder shall make all repairs at no additional cost to the Owner.

3.05 LIGHTS AND PROTECTION

A. The Design-Builder shall provide protection in accordance with the General Provisions and the following:
   1. Erect and maintain strong and suitable barriers and such warning lights as will effectively prevent the occurrence of any accident to health, limb, or property.
   2. Lights shall be maintained between the hours of sunset and sunrise or during any period of reduced visibility. .

B. Where pipe lines are to be constructed in streets, highways or roadways, the Design-Builder shall take all precautions and comply with all requirements, as may be necessary, to protect the improvements, including installation and maintenance of warning signs, lights, and barricades for the protection of traffic.

3.06 INSTALLATION - PIPE

A. Lay pipe to slope gradients with maximum variation from true slope of 1/8 inch in 10 feet.

B. Storm drain pipe and appurtenant structures shall be installed in accordance with Section 02221 – Trenching, Backfilling, and Compaction for Utility Systems.

3.07 INSTALLATION - CATCH BASINS, DROP INLETS AND JUNCTION BOXES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad with provision for storm sewer pipe end sections.

C. Establish elevations and pipe inverts for inlets and outlets as required.

3.08 SEWER LINE SERVICE

A. This project has existing sewer line services that shall be maintained. If the services are removed, the Design-Builder shall replace the lines at no additional cost to the Owner. The Design-Builder shall provide materials and labor to meet the specifications and codes of the utility owner.

B. All services not connected shall have a watertight plug or cap at the end.

C. Service, unless tapped into an existing line of suitable capacity or as otherwise directed, shall extend from the main sewer line to the property line or street right-of-way.

D. The service shall be referenced with an appropriate post marker.

E. All services shall be minimum of 6 inches in diameter, unless otherwise directed.

F. Services shall be of the same material as the main line sewer unless directed otherwise.

3.09 WATER SERVICE LINES

A. This project has existing water service lines that shall be maintained. If the services are removed, the Design-Builder shall replace the lines at no additional cost to the Owner. The Design-Builder shall provide materials and labor to meet the specifications and codes of the water service owner.

B. The Design-Builder shall protect any existing water line(s) from harm at all times. If the water line is broken, the Design-Builder shall notify the local water authority and the Owner's Project Manager as soon as possible.

3.10 FIELD QUALITY CONTROL

A. Testing shall be in accordance with General Provisions.

B. Request inspection prior to and immediately after placing aggregate cover over pipe.

C. Compaction testing will be performed in accordance with Section 022221 – Trenching, Backfilling, and Compaction.

D. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to the Owner.

3.11 PROTECTION

A. Protect pipe from damage or displacement until backfilling operation is in progress.

B. Protect drainage piping and catch basins from during construction.

END OF SECTION

SECTION 02550

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. Provide and install new water line as required.

1.02 REGULATIONS

A. Conform to Montana Public Works Standard Specifications.

1.03 SUBMITTALS

B. Submit under provisions of Section 01300.

C. Product data: Submit product data for pipe, fittings, backflow prevention, and testing.

D. Testing: Provide copies of all test results.

1.04 CLOSE OUT DOCUMENTS

A. Contractor to provide close out documents required by the City of Bozeman. Refer to Section 01700 – Project Closeout.
   1. Elevations shall be based on the North American Vertical Datum of 1988 (NAVD 88).
   2. All measurements and coordinates shown shall use the U.S. Survey Foot definition.

B. Coordinates shall be shown on all drainage structures, detention facilities, manholes, valves, fire hydrants, tees and bends.

PART 2 - PRODUCTS

2.01 PIPE

A. Ductile Iron – Shall conform to AWWA C150 and AWWA C151. All pipe shall be cement lined in accordance with AWWA C104.

B. P.V.C. Pipe – All P.V.C. pipe shall bear the seal of the National Sanitation Foundation. All waterline pipe shall be blue in color. Certificates of conformance shall be furnished with each lot of pipe supplies.

2.02 JOINTS

A. Mechanical Joints – Conform to C111.

B. Plastic Pipe – Joints in plastic pipe 4-inches and larger shall meet all requirements of ANSI/AWWA C900 latest revision. Joints in 2” plastic pipe shall conform to ASTM D3139 latest revision. Solvent joints shall not be used unless otherwise specified.

2.03 FITTINGS

A. Fittings for Ductile Iron or Plastic Pipe shall be compact ductile iron, manufactured in accordance with AWWA C153. They shall be cement lined in accordance with AWWA C104. An asphaltic coating with a thickness of 1 mil shall be applied to all fittings.

B. Fittings for 2” plastic pipe shall conform to ASTM D2241 and shall be Class 200 PVC with ring tight rubber joints

2.04 CONCRETE THRUST BLOCKING

A. Thrust Blocking shall be Class A concrete constructed in accordance with the applicable articles of the Montana Public Works Standard Specifications.

2.05 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall be in tube form conforming to the requirements of ANSI/AWWA C105/A21.5 latest revision

2.06 DETECTION TAPE

A. Detection tape/marking tape shall consist of a minimum 4.0 mil thickness inert polyethylene plastic that is resistant to alkalis, acids and other destructive elements found in the soil. The tape shall contain an opaque color concentrate designating the color code appropriate to the line being buried (Water Systems - Safety Precaution Blue with "Caution - Buried Water Line Below" imprinted in black).

2.07 TRACING WIRE

A. Tracing wire shall be #14 gauge insulated single strand copper wire.

2.08 STEEL CASING

A. Casing pipe shall be steel conforming to ASTM A139, yield point of 35,000 psi.

2.09 CASING SPACERS

A. Casing Spacers shall be bolt on style with a shell made in two (2) sections of Heavy T-304 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with PVC liner. All nuts and bolts shall be 18-8 Stainless Steel.

2.10 GATE VALVES

A. Valves 4” and larger shall be cast iron or ductile iron body, bronze mounted, resilient wedge design, with non-rising stems, conforming to AWWA C509. Valves shall have a minimum working pressure of 200 psi and be tested at 400 psi.

B. Two (2) Inch - Shall be all brass ball valve type. The pressure rating shall be 175 psi.

C. Valve Boxes - Underground 2" valves and fire hydrant valves shall be installed in accepted valve boxes unless otherwise approved. The cover shall be cast iron and shall be marked "WATER". The box and any extensions needed shall be cast iron having a crushing strength of 1,500 psi.

D. Valve Manhole for gate valves 4” and larger shall be precast concrete manholes shall meet the requirements of ASTM C478.

1. Manhole frames and covers shall be cast iron, equivalent to Neenah Foundry Co. R-1668, Type "C" solid lid with machined bearing surfaces. The cover shall be marked "WATER".
2. Tops of manholes outside of roads, streets, and highways shall be built to grades 1-inch above the existing ground surface unless otherwise shown on the plans. Manholes in roads, streets, or highways shall be built to the pavement grade or as directed by the Owner's Project Manager..

2.11 TAPPING VALVES

A. All tapping valves shall be provided with a standard flange on one end for bolting to the tapping sleeve. The outlet end shall be mechanical joint, flanged for bolting to a standard tapping machine. All tapping valves shall be resilient seat. No double disc shall be permitted. In all other respects, tapping valves shall comply with the requirements for gate valves. Tapping valves and tapping sleeves 12" diameter and smaller shall be compatible with the Mueller tapping machine.

2.12 TAPPING SLEEVES AND CROSSES

A. Tapping sleeves and crosses shall be compact ductile iron mechanical joint type conforming to AWWA C153 for fittings 4" – 16". They shall be sized to fit the intercepted pipe and be equivalent to Mueller H-615/715. All tapping sleeves and valves shall be pressure tested prior to tapping.

2.13 AIR RELEASE VALVE

A. Air Release Valve shall be 1-inch screwed inlet equivalent to Crispin Model No. PL10. All internal trim parts shall be stainless steel. No plastic parts will be permitted. The floats shall be stainless steel.
   1. The body and cover shall be cast iron conforming to ASTM A48, Class 35 and shall be able to operate at pressures up to 300 psi.
   2. The valve shall be provided with a cast iron cowl.
   3. Corporation stops for combination air/vacuum valves shall be 1" Brass or Bronze with 1-inch inlet and 1-inch outlet outside iron pipe threads equivalent to Mueller Model #H-10013.
   4. Tapping saddles for combination air/vacuum valves shall be equivalent to Smith-Blair No. 313-015.

2.14 HYDRANTS

A. Fire hydrant shall be UL listed or FM approved or listed or classified by an NRTL, and shall meet the requirements of AWWA C502.

B. Hydrants shall have two 2-1/2 inch hose outlets and one 4 ½-inch suction connection with National Standard threads in accordance with NFPA 24 and NFPA 1963. Nozzles shall be bronze and have interlocking lugs to prevent blowout.

C. Provide Dry Barrel type Fire Hydrant. Bonnet shall have a lubricating fitting for ease of lubrication. All parts shall be removable through top of hydrant without removing entire barrel section.

D. Drain Valves and Openings – Positive operating drain valves shall be provided to assure drainage of fire hydrant when the main valve is closed. Drain openings shall have bronze bushings.

E. Main Valve – Valve shall be designed to close with the pressure and remain closed. Valve shall be bronze Grade A, B, D, or E, that will resist rocks and other foreign matter. Valve shall have a full 4 ½ -inch opening.

2.15 STANDARD METER BOX

A. Meter Box shall be manufactured of high grade supper flexion, or equal. The physical properties shall be in accordance with the following standards.
   1. Tensile strength ASTM D638
   2. Flexural Modulus ASTM D790
   3. Notched Izod Impact Strength ASTM D256
   4. Deflection Temperature ASTM D648

B. The meter box shall have a minimum body weight of six (6) pounds and shall be Brooks Series 1419 or approved equal.

2.16 NON-FREEZE HOSE BIBB

A. Unit shall be for outdoor use, non freeze ¾" hose bibb. Unit shall be self-draining to avoid freezing. Unit shall be self-supporting. All units shall include a backflow preventor (double check valve assembly) in an above ground assembly.

PART 3 - EXECUTION

3.01 INSTALLATION: Ductile iron pipe shall be laid in accordance with ANSI/AWWA C600; Plastic pipe shall be laid in accordance with AWWA M23, ASTM D2774, UNI-Bell UNI-B-3 and the pipe manufacturer's recommendations.

A. Alignment and Grade - The water mains shall be laid and maintained to lines and grades established with fittings, valves, and hydrants at the required locations unless otherwise accepted by the Owner. Hydrants shall be installed plumb.

B. Trench Construction - The trench shall be excavated to the alignment, depth, and width required for conformance with all federal, state, and local regulations for the protection of the workers.

C. Pipe Installation - Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. Where necessary, the trench shall be dewatered prior to installation of the pipe.

D. Hydrants – Hydrants shall be installed adjacent to paved areas, no less than 3 feet and no more than 7 feet from the roadway shoulder or curb line, accessible to fire department apparatus. Installations shall be in accordance with NFPA 24, except where modified herein.

E. Backfill and Compaction - All trenches and excavation shall be backfilled immediately after the pipes are laid therein, unless other protection of the pipe line is directed.

F. New Service Connections – The Design-Builder shall tap the main and install a service connection as directed by the City of Bozeman. The water service connection shall be marked on the curb with a "W". When the water system is accepted by the City, all laterals shall be completed by removing the locks and placing the curb stop in a Standard Meter Box.

G. Jacking and Boring – Where the work involves a highway, the State Department of Transportation shall be notified three (3) days before the crossing is started. Before commencing work within the rights-of-way of the highways, the Design-Builder shall verify that the Owner has obtained the required permits.

H. Detection Tape - Detection tape will be used over all pipe and tubing. The tape shall be laid 18" below finished grade.

I. Tracing Wire - Tracing wire will be installed on all water mains and water service laterals directly on top of the water line. This tracing wire system shall be checked and tested by the Design-Builder in the presence of Owner's personnel prior to acceptance of the water main installation. All equipment, meters, detectors, etc., needed for testing shall be furnished by the Design-Builder.

J. Polyethylene Encasement - Polyethylene encasement shall be used on all ductile iron piping, fittings, valves and appurtenances and installed according to the requirements of ANSI/AWWA C105/A21.5, Sec. 5.4, Method A.

3.02 SEPARATION BETWEEN WATER AND SEWER

A. Water mains shall not be laid closer than 10 feet horizontally to a sanitary or storm sewer without written instruction from the Owner's Project Manager. Some deviation may be allowed for installation of the water main closer to a sewer, provided that the water main is laid in a separate trench and the bottom of the water main is at least 18 inches above the top of the sewer.

3.03 PROCEDURES FOR CONNECTIONS OF WATER MAINS

A. Procedure - Any physical connection of untested water mains with existing water mains is prohibited except as allowed and approved by the Owner's Project Manager or local authority having jurisdiction.

3.04 CLEANING & DISINFECTION OF NEW MAINS

A. After the hydrostatic test has been satisfactorily completed, all water mains must be cleaned, sterilized, and the water passing through them must show by laboratory tests safe results before the system can be accepted and placed in service. The Design-Builder shall provide, at his expense, all labor, materials and equipment required to sterilize, flush and test piping installed under this contract

3.05 EXISTING SYSTEM

A. The existing water distribution system shall be kept in service until the new system has been constructed, sterilized, and accepted by the City of Bozeman and the Owner.

3.06 GRASSING:

A. All disturbed areas shall be grassed in accordance with Section 02485 "GRASSING" unless otherwise indicated.

3.07 HYDROSTATIC AND LEAKAGE TESTS:

A. The pipe shall be tested at a minimum of 150 psi for two (2) hours in accordance with ANSI/AWWA C600. A maximum loss of 3 psi will be allowed during the two (2) hour test.

3.08 COMPACTION TESTING:

A. Contractor shall provide laboratory tests of the soil in accordance with ASTM D-698. In-place density tests shall be made in accordance with ASTM D-1556 or D-2922. Results of the tests shall be furnished to the Owner by the testing laboratory.

END OF SECTION

SECTION 02553

SEWERAGE FLOW CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sewage flow in a sanitary sewer line shall be controlled for the purpose of replacing the sewer lines or reducing risk of exposure to a sanitary sewer line break where the sewer line crosses a trench or excavation.

1.2 DEFINITIONS

A. By-pass pumping shall be defined as the pumping of raw sewage from one point to another point in order to eliminate flow through a section of sewer pipe and manholes.

1.3 SUBMITTALS

A. Submit in accordance with Section 01300.

B. Manufacturer's Catalog Data: The Design-Builder shall submit manufacturer's descriptive literature and available performance test data for the pumps used in sewer flow control.

C. Operation Plan: The Design-Builder shall provide a written description and detail plans of by pass pumping

D. Schedules: The Design-Builder shall submit a schedule of sewerage flow control operations for each area.

E. The Design-Builder shall not proceed with any work until the submittals are approved by the Owner’s Project Manager.

1.4 PROJECT CONDITIONS

A. Sewer lines and manholes shall not be plugged or blocked for more than two hours. Should the work necessitate the severance of sewer service for more than two hours, the Design-Builder shall provide bypass pumping.

B. Sewer service connections shall not be plugged or stopped for more than 8 hours. If the Work requires the service to be blocked more than eight hours, the Design-Builder shall provide sewer service by-pass pumping.

C. Design-Builder shall notify each user of sewer service being stopped or plugged 24 hours in advance of construction. Notification shall be written and hand delivered to users.

PART 2 – MATERIALS - Not Used

PART 3 – EXECUTION

3.1 GENERAL

A. Design-Builder shall provide the necessary equipment, materials, labor, and supervision for the purpose of plugging off and pumping down the sewer lines in the designated areas.

3.2 EXECUTION

A. Pneumatic plugs shall be supplied for the lines to be blocked. After the work has been completed, flow shall be restored to normal.

B. Pumping operations shall continue until such time as the designated area is pumped down, necessary work is completed and normal flow is restored. For repairs to be made, pumping operations shall continue until the repair is successfully completed.

3.3 PRECAUTIONS

A. When flow in a sewer line is plugged, blocked, or bypassed, sufficient precautions shall be taken to protect the sewer lines from damage that might result from sewer surcharging. Further precautions shall be taken to insure that sewerage flow control operations do not cause flooding or damage to property being served by sewers involved.

END OF SECTION

SECTION 02600

PAVING AND SURFACING

PART 1 – GENERAL

1.1 REFERENCES

A. Montana Public Works Standard Specifications, Fifth Edition, March 2003.

1.2 DESCRIPTION OF WORK

A. Design-Builder shall provide pavement as shown in the Pre-Architectural Program or in accordance with Design-Builder's design submittal.

1.3 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

B. Material Certificates: Provide copies of the materials certificates signed by the material producer and Design-Builder indicating that each material complies with or exceeds specified State of Montana requirements.

C. Submit copies of all test reports on base and surface compaction to the Owner's Project Manager.

1.4 SITE CONDITIONS

A. Weather Limitations: Apply prime and tack coats in accordance with Montana Public Works Standard Specifications and best practices acceptable to the Owner's Project Manager. Do not apply when base is wet of contains an excess of moisture.

B. Construct asphalt concrete surface course when atmospheric temperature is above 40^F (4^C) and when base is dry. Base course may be placed when air temperature is above 30^ F (-1^C) and rising.

C. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.1 BASE COURSE

A. Hot Mix Asphaltic Concrete - Shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphaltic cement in a central mixing plant. The gradations, asphalt content and stabilities shall be in accordance with applicable provisions of the Montana Public Works Standard Specifications, Fifth Edition, March 2003.

B. Graded Aggregate Base Course - The aggregate shall consist of processed and blended crushed granite stone. Aggregates shall be free from lumps and balls of clay, organic matter, objectionable coatings and other foreign material and shall be durable and sound. Aggregate shall meet the applicable requirements of the Montana Public Works Standard Specifications, Fifth Edition, March 2003.

2.2 PRIME AND TACK COATS

A. Prime Coat - The prime coat shall consist of liquid asphalt, MC-70.

B. Tack Coat - The tack coat shall consist of emulsified asphalt SS-1 or SS-1h, emulsified asphalt

CRS-1 or CRS-2.

2.3 SURFACE COURSE

A. The surface course shall consist of fine and coarse aggregate and mineral filler uniformly mixed with hot asphalt cement in a central mixing plant. Materials shall comply with Montana Public Works Standard Specifications.

2.4 PAVEMENT FABRIC

A. Fabric used for underlayment shall be equivalent to Phillips Petromat.

2.5 TRAFFIC LINE PAINT

A. Traffic Line Paint - Shall conform applicable sections of the Standard Specifications for Road and Bridge Construction, Department of Transportation, State of Montana. The color shall be at the direction of the Contracting Officer or as specified in the plans.

PART 3 - EXECUTION & TESTING

3.1 TESTS

A. Design-Builder shall provide tests in accordance with the Montana Public Works Standard Specifications. Compaction tests shall be made at the Owner's direction and expense. Failed tests shall be rescheduled at the Owner's direction and retesting shall be paid for by the Design-Builder.

3.2 PAVEMENT LOCATIONS, GRADE, AND ALLOWABLE TOLERANCES

A. The locations of pavement are shown in the Pre-Architectural Program. Finished pavement grade must make allowances for the thickness of pavement when preparing the subgrade.

B. Surfaces - The finished surfaces of pavement shall not vary more than 1/8 inch above or below the planned grade lines or elevations established at the job site. The finished surfaces of new abutting pavements shall coincide at their juncture. Where a new pavement abuts an existing pavement, a transition pavement strip shall be installed to the juncture of the new and existing pavement

C. Thickness -
   1. Permissible Deviation – May be up to 1/8-inch of the required thickness for asphaltic concrete wearing surfaces. Deviation in base courses may be up to 3/8-inch.
   2. Pavements Deficient in Thickness - Pavement areas deficient in thickness shall be removed and replaced with pavement of the indicated thickness.

3.3 FIELD QUALITY CONTROL

A. Equipment - All equipment, tools and machines, used in the performance of the work required by this section of the specifications shall be subject to the acceptance of the Owner and shall be maintained in satisfactory working condition at all times.

B. Weather Limitations - The prime or tack coat shall be applied only when the base course or pavement is dry or contains moisture not in excess of the amount that will permit uniform distribution and the desired penetration and when the temperature has not been below 35 degrees F. for 12 hours immediately prior to application. The prime or tack coat shall only be applied when the atmospheric temperature in the shade is 55 degrees F. or above.

C. Preparation of Surface - All loose material, dirt, clay or other objectionable material, shall be removed from the surface to be treated before applying the pavement course. Portion(s) of the surface prepared for immediate treatment shall be dry and in satisfactory condition.

3.4 SEQUENCE OF CONSTRUCTION

A. Sequence of operations shall follow best industry standards and Montana Public Works Standard Specifications.

3.5 PROOF ROLLING

A. If required by the Owner's Project Manager, proof rolling shall be done after water pipes have been lowered, services installed and sewers backfilled. The operation shall be in accordance with methods described in applicable sections of the Montana Public Works Standard Specifications.

3.6 GRADED AGGREGATE BASE COURSE

A. Aggregate shall be placed in accordance with Montana Public Works Standard Specifications. The base or subbase aggregate shall be thoroughly wetted to optimum moisture (± 1-1/2%) content as determined by ASTM D-698.

B. Excavation - The subgrade shall be leveled to the lines and grades required.
   1. Subgrade Preparation - Prior to constructing the graded aggregate base course, the subgrade shall be cleaned of all foreign substances and shall contain no frozen material.

C. Compaction - While at Optimum moisture (± 1-1/2%), the aggregate base shall compacted to a maximum laboratory dry density of 100% of ASTM D-698.

D. Deviation of surface shall not be in excess of 1/4-inch when tested with a 10 foot straight edge. Deviation in thickness of the base shall be up to but not including 3/8-inch of the required thickness.

E. Maintenance - The base shall be maintained in a condition that will meet all specification requirements until the work is accepted.

3.7 BITUMINOUS PRIME/TACK COATS

A. Bituminous Prime Coat - Bituminous material for the prime coat shall be applied in quantities prescribed by the Montana Public Works Standard Specifications. All irregularities in the base surface shall be corrected prior to application of the prime coat.

B. Bituminous Tack Coat - Bituminous material for the tack coat shall be applied in quantities and under weather and other conditions stipulated by Montana Public Works Standard Specifications. The entire surface to be paved shall be coated with the tack coat.

3.9 ASPHALTIC CONCRETE BASE AND SURFACE COURSES

A. Mixing Plants – Asphaltic-concrete shall be mixed in central plants conforming to the applicable requirements of the Montana Public Works Standard Specifications.

B. Equipment – Application equipment that meets Montana Public Works Standard Specifications may be used.

C. Weather Limitations - Bituminous courses shall be constructed only when the base course, binder course or the existing pavement is dry and when the weather is not rainy. Unless otherwise directed, asphaltic courses shall not be constructed when the air temperature in the shade is below 40 degrees F.

D. Preparation of Base - The surface of the base course will be checked by the design Engineer and, when desired by the Owner, the Owner's Project Manager for adequate compaction and

surface conditions.

E. Grade Control - The lines and grades shown on the contract drawings for each pavement category of the contract shall be established and maintained by means of line and grade stakes placed at the site of the work by the Design-Builderr.

F. Transportation of Bituminous Mixture - Transportation of bituminous mixture shall be from the paving plant to the site in quantities to allow the spreading and rolling of all mixture prepared for one day's run to be completed during daylight.

G. Placing – Place, compact, patch and protect all materials in required quantities by allowable methods and operations stipulated by applicable Montana Public Works Standard Specifications.

3.10 ADJUST EXISTING VALVES, INLETS AND MANHOLES

A. Existing inlets, manholes, or valve boxes shall be adjusted by the Design-Builder to the new grade lines and elevations. All adjustments to structures in areas proposed for pavement shall be accomplished prior to construction of the surface course.

3.11 REMOVE AND REPLACE PAVEMENT

A. Pavement removed and replaced shall be done in accordance with the Montana Public Works Standard Specifications. Traffic shall be maintained and controlled by means of flagmen.

3.12 TRAFFIC LINE STRIPING

A. Striping shall consist of furnishing and applying traffic line paint in accordance with the Pre-Architectural Program and Montana Public Works Standard Specifications.

B. Equipment – Equipment used shall be in accordance with applicable Montana Public Works Standard Specifications..

C. Cleaning of Surface - All surfaces to be painted shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint.

D. Alignment - Traffic stripes shall be of the length, width and placement specified. On sections where no previously applied markings are present, the Contractor shall establish control points.

E. Application - Traffic stripe paint may be applied by machine except for special areas and markings that are not adaptable to machine application, in which case hand application will be permitted. Painting shall be done only during daylight hours under favorable weather conditions.

F. Protective Measures – Protective measures required by the City of Bozeman and/or the Montana Public Works Standard Specifications shall be taken when painting is done on public streets.

G. Acceptance - All sections of painted stripe, words, and symbols which have dried to the extent that the paint will not be picked up or marred by the tires of vehicles, and which have been placed in reasonably close conformity with the Plans and Specifications, will be accepted, and the Design-Builder will be relieved of the responsibility of maintenance on such sections.

END OF SECTION

SECTION 02607

MANHOLES AND COVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

Modular precast concrete manhole sections with tongue-and-groove joints with eccentric transition to lid frame, covers, anchorage, and accessories.

1.02 REFERENCES

ASTM C 270 Mortar for Unit Masonry
ASTM C 443 Joints for Circular Pipe Using Rubber Gaskets
ASTM C 478 Precast Reinforced Concrete Manhole Sections
ASTM C 923 Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes
Applicable provisions of Montana Public Works Standard Specifications, Fifth Edition, March 2003

1.03 SUBMITTALS

A. Submit according to Section 01300 - Submittals.

B. Shop Drawings: For any change of manhole requirements set forth in this specification, submit dimensional drawings showing pipe layout, gradient of slope, depth of unit, elevation of invert and top.

C. Product Data: For precast manhole, frame and cover, and pipe connectors.

PART 2 PRODUCTS

2.01 MANHOLE

A. Reinforced Precast concrete in accordance with ASTM C 478 with Gaskets in accordance with ASTM C 443.

B. Portland cement, type ll, concrete for structures shall conform to ASTM C 94.

C. 28 day compressive strength of concrete shall not be less than 3000 psi.

D. After seven days shall have compressive strength of not less than 2000 psi.

E. Billet Steel, intermediate grade, made by the open hearth process, conforming to the requirements of the "Standard Specifications for Billet Steel Concrete Reinforcement Bars", Serial Designation C 15-33 as given in ASTM A 615.

F. Provide all necessary support bars, tie bars, etc. required for properly supporting and spacing the bars.

G. Wire mesh used as reinforcement shall be of size and spacing indicated. the wire mesh shall comply with ASTM A 185.

H. Transition from manhole sections to grade shall be eccentric type.

I. Minimum wall thickness shall be 5 inches.

J. Cast-in-place bases shall be at least 8 inches in thickness and shall be extend at least 6 inches radially outside the manhole section.

2.02 RING AND COVER

A. Gray iron castings, Class 30B, ASTM A 48. They shall be “anti-rattle” type.

B. Cover shall have the words "Sanitary Sewer" or "Storm Sewer" cast in metal, where applicable.

C. Cover shall contain no more than two pick-up holes.

D. Cover shall be MC-18 as manufactured by Sumter Machinery, or approved equal.

E. Frame shall be MF-11 as manufactured by Sumter Machinery, or approved equal.

F. Bearing surfaces shall be ground so that cover is insured of a tight fit.

G. If located in the 100 year flood level ring and cover shall be sealed watertight.

2.03 STEPS

A. Provide corrosion-resistant rubber steps reinforced with 1/2 inch diameter steel rod as manufactured by Oliver Tire and Rubber Company, or approved equal.

B. Formed integral with manhole sections.

2.04 FLEXIBLE PIPE CONNECTIONS

A Conforming to ASTM C 923, inlet and outlet pipes shall be joined to the manhole with a synthetic rubber boot which creates a watertight seal both manhole and pipe while allowing differential settlement.

B. Minimum thickness of 3/8 inch.

C. Allow from 5 to 35 degrees deflection throughout all planes.

D. All metallic accessories shall be 316 stainless steel only.

2.05 CONFIGURATION

A. Shaft Construction: Concentric with eccentric cone top section, lipped male/female joint, and openings for receiving pipe.

B. Shape: Cylindrical

C. Clear Inside Dimensions: 48 inches

D. Design Depth: As indicated

E. Clear Lid Opening: 26 inches

F. Pipe Entry: Provide openings as indicated.

G. Steps: 12 inches wide, 12 inches on center vertically, set into manhole wall.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify items provided by other sections of Work are properly sized and located.

B. Verify that built-in items are in proper location, and ready for roughing into Work.

C. Verify that the manhole location is properly located as required.

D. Verify excavation for manholes is correct.

3.02 PREPARATION

A. Coordinate placement of inlet and outlet pipe required.

3.03 PLACING MANHOLE SECTIONS

A. Place, level, and compact stone bedding as required.

B. Place and level first precast section on the stone bedding.

C. Carefully adjust to true grade and alignment with all inlet pipes properly installed.

D. Unit with pipes install must form and integral watertight unit.

E. Uniformly supported by the stone bedding, the first section shall not bear directly on any of the pipes.

F. Place and align sections to provide vertical sides and vertical alignment of the ladder rungs.

G. The completed manhole shall be rigid, true to dimensions, and be watertight.

H. Where the ground water table is expected to reach above the invert, seal the exterior with bitumastic material.

I. Set cover frames and covers level without tipping, to correct elevations.

J. In paved streets or areas which have been brought to grade, not more than 16 inches shall be provided for adjustment of the casting ring to street grade.

K. The top of manhole casting shall be flush with the street surface.

L. Form the invert channels directly in the concrete of the manhole base, with mortar, or by laying full section sewer pipe through the manhole and breaking out the top half after surrounding concrete has hardened. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1 inch per foot or more than 2 inches per foot.

END OF SECTION

SECTION 02832

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work Included
1. Fence framework, gates, fabric, and accessories.
2. Excavation for post footings and rat wall.
3. Concrete for post footings and rat wall.
4. Fencing/Gypsum Board security ceiling attached to lightgage metal framing.

1.02 RELATED WORK

A. Clearing and grading.

B. Soil sterilization.

C. Lightgage metal framing.

1.03 REFERENCES

A. American Society for Testing Materials (ASTM Standards).
1. A90 - Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
2. A120 - Specification for Pipe, Steel, Black and Hot Dipped Zinc-Coated (Galvanized) Weld and Seamless, or ordinary uses.
3. A392 - Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
4. A428 - Test Method for Weight of Coating on Aluminum-Coated Iron or Steel Articles.
5. A446 - Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
6. A478 - Chromium-Nickel Stainless and Heat Resisting Steel Weaving Wire.
7. A569 - Specification for Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled, Commercial Quality.
8. A817 - Specification for Metallic-Coated Steel Wire for Chain Link Fence Fabric.
9. A824 - Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.
10. B117 - Method of Salt Spray (Fog) Testing.
11. C33 - Specification for Concrete Aggregate.
12. C94 - Ready-Mixed Concrete.
13. F567 - Standard Practice for Installation of Chain Link Fence.
14. F626 - Specification for Fence Fittings.

B. Federal Specification:
1. FS L-P-512 Black Polyethylene Sheeting type III 8 mil.

1.04 QUALITY ASSURANCE

A. Manufacturer: Company specializing in commercial quality fence products with at least five years experience.

B. Fence framework, fabric and related accessories to be a complete system as specified herein.

1.05 SUBMITTALS

A. Shop Drawings: Include complete details of fence construction, fence height, post spacing, dimensions and unit weights of framework and concrete footings and rat wall details.

B. Product Data: Manufacturer's catalog cuts with printed specifications.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS: (FENCING)

A. Acceptable Manufacturers
1. Allied Tube & Conduit Corp.
2. Anchor Fence, Inc.
3. Cyclone Fence/United States Steel Corp.
4. American Security Fence Corp.

2.02 MATERIALS

A. Framework: Type I or Type II Steel Pipe.
1. Type I - Schedule 40 steel pipe with 1.8 ounces of zinc coating per square foot of surface area conforming to Standard Specification ASTM A120; or
2. Type II - Pipe manufactured from steel conforming to ASTM A569 or ASTM A446, Grade D, cold-formed, high frequency welded and having a minimum yield strength of 50,000 psi. External surface triple coated with 1.0 ounce ± 0.2 mils or clear, acrylic/polyurethane coating. Internal surface shall be a hot-dip zinc coated or coated, after welding, with zinc-rich based organic coating having an 87% zinc powder loading capable of providing galvanic protection.
3. Pipe shall be straight, true to section and conform to the following weights:

Pipe Size Outside Dia.	Type I Wt. Lbs/Ft. (Min.)	Type II Wt. Lbs/Ft. (Min.)
1.66"	2.27	1.82
1.90"	2.72	2.27
2.875"	5.79	4.64
4"	9.11	6.56

B. Fabric: Zinc-coated steel. Zinc-coated fabric shall be galvanized after weaving with a minimum 2.0 ounces of zinc per square foot of surface area and conform to ASTM A392, Class 2.

C. Fittings: Pressed steel or cast iron, galvanized with a minimum of 1.2 ounces of zinc per square foot of surface area, or cast aluminum alloy, all conforming to ASTM F626.

D. Fence Fabric and Sheet Metal Cover Fastener: of size recommended by manufacturer for each application, as manufacturered by Sure-Loc, 321 Lafayette Ave., Kenilworth, N.J. 07033 phone:(908)272-9171 or equivalent product approved by Owner’s Project Manager.

2.03 CONCRETE MIX

A. ASTM C94 Portland Cement concrete with maximum 3/4" aggregate having a minimum compressive strength of 3,000 psi at 28 days.

2.04 COMPONENTS

A. Corner Posts, End Posts, and Pull Posts:
   1. Size: 4" O.D. pipe (Type I or Type II).
   2. All posts shall be plumb within 5 degrees (± 1°) in two planes.
   3. Deflection: When a force of 70 pounds is applied perpendicular to the fence at the top of the post, it shall not deflect more than 1" at that location.
   4. Pull posts shall be used at all abrupt changes in grade, direction, and at intervals no greater than 300 feet.
   5. Posts shall be horizontally braced at mid-point with brace rails and diagonally trussed.

B. Line Posts:
   1. Size: 2.875" O.D. pipe (Type I or Type II.)
   2. Space posts equidistant in the fence-line, with a maximum of 10' on centers.
   3. All posts shall be plumb within 5 degrees (± 1 degree) in two planes.
   4. Deflection: When a force of 38 pounds is applied perpendicular to the fence at the top of the post, it shall not deflect more than 1" at that location.

C. Top and Intermediate Rails:
   1. Install top rails continuously through post caps or extension arms; install intermediate rails in one piece between posts and flush with posts on fabric side
   2. Size: 1.66" O.D. pipe (Type I or Type II).
   3. Each joint where a rail meets a post shall be secured so that no perceivable movement between the two pieces takes place when the fence fabric is flexed.

D. Fabric: Galvanized steel wire, 9 gauge, woven in a 2" diamond mesh with top selvage twisted and barbed and bottom selvage knuckled. Furnish one piece fabric widths.

E. Fittings:
   1. Post Caps: Pressed steel, cast iron or cast aluminum alloy designed to fit snugly over posts to exclude moisture. Supply cone type caps for terminal posts and loop type for lien posts. All caps to be equipped with set screws.
   2. Rail and Brace Ends: Pressed steel, cast iron or cast aluminum alloy, cut-shaped to receive rail and brace ends.
   3. Top Rail Sleeves: Tubular steel, 0.051 thickness x 7" long, expansion type.
   4. Tension Bars: Steel strip 0.625" wide x 0.1875" thick.
   5. Tension Bands: Pressed steel, 14 gauge thickness x 0.75" wide.
   6. Brace Bands: Pressed steel, 12 gauge thickness x 0.75" wide.
   7. Truss Rods: Steel rod, 0.375" diameter merchant quality with turnbuckle.

F. Tension Wire: Marcelled 7 gauge steel wire with minimum coating of 0.8 ounces of zinc per square foot of wire surface and conforming to ASTM A824.

G. Tie Wires: Steel, 9 gauge, hot-dip galvanized.

H. Hog Rings: Steel wire, 11 gauge, minimum zinc coating of 0.80 ounces PSF of wire surface.

I. Ground Stakes: Number 3 galvanized reinforcing rods, 18" long.

J. Gate Posts:
   1. Gate posts normal width single gate or double 6'-0" width or less: 2.875" dia.
   2. Gate posts larger than normal width but less than 13'-0" in width: 4.000" dia.

K. Gate Frames:
   1. Gate frames leaf widths not exceeding 8'-0": 1.660" dia.
   2. Gate frames leaf widths over 8'-0" width: 1.900" dia.

L. Gates: Welded construction with adjustable, diagonal cross bracing. Provide the following hardware for gates:
   1. Hinges: Steel or malleable iron of size to suit gate size, non-lift off type, offset to allow 180° operation. Furnish one pair of hinges per leaf.
   2. Latch for pass leaf gate: Forked type with center drop rod or plunger bar, integral padlock eye, complete with keeper to receive padlock.
   3. Stops: Mushroom type at double leaf gates; to engage drop rod or plunger bar.

PART 3 EXECUTION

3.01 INSPECTION

A. Installer shall examine site and report in writing to Owner's Project Manager any conditions detrimental to the proper and timely completion of the work.

3.02 INSTALLATION

A. General: Fence installation to conform to requirement of ASTM F567.

B. Height: Provide fence height as indicated on contract drawings.

C. Post Spacing and Settings: Space line posts at intervals not exceeding 10'-0". Set terminal, gate and line posts plumb in concrete footings. Top of footing shall be 2" above grade and sloped to direct water away from posts.

E. Bracing: Brace terminal posts back to adjacent line posts with horizontal brace rails and diagonal truss rods.

F. Top Rail: Install through line post loop caps connecting sections with sleeves to form a continuous rail between terminal posts. Fasten to terminal posts.

G. Bottom Tension Wire: Stretch between terminal posts 2" below grade and fasten to outside of line posts with tie wires.

H. Fabric: Pull fabric taut to provide a smooth uniform appearance, free from sag, with bottom selvage 6" below grade. Fasten and tie fabric to posts with appropriate fastening devices.

I. Rat Wall shall be 6" W x 12" D, top set flush with the finish grade. Pour concrete after fabric has been stretched and tension wire has been installed. Embed bottom 6" of fabric in rat wall.

J. Fasteners: Install nuts for fittings, bands and hardware bolts on inside of fence. Peen ends of bolts or score threads to prevent removal.

K. Install gates complete with specified hardware at locations indicated. Adjust and lubricate hardware.

3.03 COMPLETION

A. Leave area of installation neat and free of any debris caused by the erection of the fence(s).

END OF SECTION

SECTION 02950

TREES, PLANTS, AND GROUND COVER

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preparation of subsoil and topsoil.

B. Topsoil bedding.

C. New trees, plants, and ground cover.

D. Mulch and fertilizer.

E. Maintenance.

F. Tree Pruning.

1.02 RELATED SECTIONS

A. Section 02485 - Grassing.

1.03 REFERENCES

A. ANSI Z60.1 - Nursery Stock.

B. NAA (National Arborist Association) - Pruning Standards for Shade Trees.

1.04 DEFINITIONS

A. Weeds: Any plant life not specified or scheduled.

B. Plants: Living trees, plants, and ground cover specified in this Section.

1.05 SUBMITTALS

A. Section 01300: Procedures for submittals.

B. Maintenance Data: Include cutting and trimming method; types, application frequency, and recommended coverage of fertilizer; and watering.

C. Submit list of plant life sources.

1.06 QUALITY ASSURANCE

A. Nursery Qualifications: Company specializing in growing and cultivating the plants with three years documented experience.

B. Installer Qualifications: Company specializing in installing and planting the plants with five years documented experience and approved by nursery.

C. Tree Pruner Qualifications: Company specializing in pruning trees with proof of Arborist Certification.

D. Tree Pruning: NAA - Pruning Standards for Shade Trees.

E. Maintenance Services: Performed by installer.

1.07 REGULATORY REQUIREMENTS

A. Comply with applicable land clearing and tree protection ordinance(s).

B. Comply with regulatory agencies for fertilizer and herbicide composition.

C. Provide certificate of compliance from authority having jurisdiction indicating approval of plants, fertilizer and herbicide mixture.

D. Plant Materials:
1. Certified by federal and state department of agriculture; free of disease or hazardous materials.
2. Comply with applicable provisions of Montana Public Works Standard Specifications, Fifth Edition, March 2003.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01400.

B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

C. Protect and maintain plant life until planted.

D. Deliver plant life materials immediately prior to placement. Keep plants moist.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install plant life when ambient temperatures may drop below 35 degrees F or rise above 90 degrees F.

1.10 WARRANTY

A. Provide one year warranty under provisions of Section 01700.

B. Warranty: Include coverage for one continuous growing season; replace dead or unhealthy plants.

C. Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

1.11 MAINTENANCE SERVICE

A. Maintain plant life until Date of Final Completion.

B. Maintenance to include:
1. Cultivation and weeding plant beds and tree pits.
2. Applying herbicides for weed control in accordance with manufacturer's instructions. Remedy damage resulting from use of herbicides.
3. Remedy damage from use of insecticides.
4. Irrigation sufficient to maintain proper growth.
5. Pruning, including removal of dead or broken branches, and treatment of pruned areas or other wounds.
6. Disease control.
7. Maintaining guys, turnbuckles, and stakes. Adjust turnbuckles to keep guy wires tight. Repair or replace accessories when required.
8. Replacement of mulch.

PART 2 - PRODUCTS

2.01 TREES, PLANTS, AND GROUND COVER

A. Trees, Plants, and Ground Cover: Species and size identifiable in plant schedule, grown in climatic conditions similar to those in locality of the Project.

2.02 SOIL MATERIALS

A. Topsoil: Excavated from site.

2.03 SOIL AMENDMENT MATERIALS

A. Fertilizer: Standard commercial fertilizers supplied separately or in mixtures containing specified percentages of total nitrogen, available phosphoric acid, and water soluble potash as recommended for the specific plant materials.

B. Peat Moss: Shredded, loose, sphagnum moss; free of lumps, roots, inorganic material or acidic materials; minimum of 85 percent organic material measured by oven dry weight, pH range of 4 to 5; moisture content of 30 percent.

C. Bone Meal: Raw, finely ground, commercial grade, minimum of 3 percent nitrogen and 20 percent phosphorous.

D. Lime: Ground limestone, dolomite type, minimum 85 percent carbonates.

E. Water: Clean, fresh, and free of substances or matter which could inhibit vigorous growth of plants.

2.04 MULCH MATERIALS

A. Shredded Hardwood Mulch: Provide shredded hardwood mulch for plant and ground cover that is fresh clean, free from sticks, cones, leaves, debris, and 95% hardwood bark. No particles may exceed 6 inches in length.

2.05 ACCESSORIES

A. Stakes: Hardwood lumber, pointed end.

B. Cable, Wire, Eye Bolts and Turnbuckles: Non-corrosive, of sufficient strength to withstand wind pressure and resulting movement of plant life.

C. Plant Protectors: Rubber sleeves over cable to protect plant stems, trunks, and branches.

2.06 TOP SOIL MIX

A. A uniform mixture of 1 part peat and 4 parts topsoil by volume.

2.07 SOURCE QUALITY CONTROL AND TESTS

A. Provide testing and analysis of existing topsoil.

B. Analyze to ascertain percentage of nitrogen, phosphorus, potash, soluble salt and organic matter; pH value.

C. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that prepared subsoil areas are ready to receive work.

B. Saturate soil with water to test drainage.

C. Verify that required underground utilities are available, in proper location, and ready for use.

3.02 PREPARATION OF SUBSOIL

A. Prepare subsoil to eliminate uneven areas. Maintain profiles and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated subsoil.

C. Scarify subsoil to a depth of 4 inches where groundcover plants are to be placed. Repeat cultivation in areas where equipment, used for hauling and spreading topsoil, has compacted subsoil.

D. Dig pits and beds 12 inches larger than plant root system on shrubs and 12 inches on trees.

3.03 PLACING TOPSOIL

A. Spread topsoil to a minimum depth of 4 inches over area to be planted/grassed. Rake smooth.

B. Place topsoil during dry weather and on dry unfrozen subgrade.

C. Remove vegetable matter and foreign non-organic material from topsoil while spreading.

D. Grade topsoil to eliminate rough, low or soft areas, and to ensure positive drainage.

E. Install topsoil into pits and beds intended for plant root balls.

3.04 FERTILIZING

A. Apply fertilizer in accordance with manufacturer's instructions.

B. Apply after initial raking of topsoil.

C. Mix thoroughly into upper 2 inches of topsoil.

D. Lightly water to aid the dissipation of fertilizer.

3.05 PLANTING

A. Place plants for best appearance for review and final orientation by Owner’s Project Manager.

B. Set plants vertical.

C. Remove non-biodegradable root containers.

D. Set plants in pits or beds, partly filled with prepared plant mix, at a minimum depth as indicated on drawings under each plant. Remove loosen burlap, ropes, and wires, from the root ball.

E. Place bare root plant materials so roots lie in a natural position. Backfill soil mixture in 6 inch layers. Maintain plant life in vertical position.

F. Saturate soil with water when the pit or bed is half full of topsoil and again when full.

3.06 INSTALLATION OF ACCESSORIES

A. Place hardwood mulch at all plantings.

3.07 PLANT SUPPORT

A. Brace plants vertically with plant protector wrapped guy wires and stakes.

3.08 TREE PRUNING

A. Prune trees only as directed by Owner’s Project Manager.

3.09 FIELD QUALITY CONTROL

A. Plants will be rejected if a ball of earth surrounding roots has been disturbed or damaged prior to or during planting.

3.10 MAINTENANCE

A. Trim plants as needed for neat appearance.

B. Immediately remove clippings after trimming.

C. Water to prevent soil from drying out.

D. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions.

E. Apply pesticides in accordance with manufacturer’s instructions.

END OF SECTION